stimulate other well-meaning members of parliament to do what they can to qualify themselves to conduct the legislation of the country on broader, more enlightened, and more scientific principles than have ever hitherto been brought into play. Meantime those who have the true welfare of our country at heart will use every means to get education in science introduced into all our schools and colleges without distinction, so that in future years rulers and people will be guided in their public conduct not by party prejudices but by the principles of scientific statesmanship.

NICHOLSON'S PALÆONTOLOGY

A Manual of Palæontology, for the Use of Students. With a General Introduction on the Principles of Palæontology. By H. Alleyne Nicholson, M.D., &c., Professor of Natural History in the University of St. Andrew's. Second Edition. (W. Blackwood and Sons, 1879.)

IT is a great pity that there should be any demand for a Student's Manual of Palæontology. The separation of the study of extinct forms of life from that of recent animals, which is implied in the term Palæontology, and which is unfortunately largely maintained in practical science, is much to be deplored. In nearly all great museums, as in the British Museum, the fossil series of animal remains are preserved and displayed in different parts of the museum from that in which the recent ones repose and are studied and taken care of by a separate staff of officials. The extinct corals, for example, are in the hands of one set of naturalists and the recent corals in the hands of another, the most closely allied or even identical species are widely separated from one another, and considerable labour and trouble are caused to any observer who wishes to bring them together for comparison. There are necessary gaps enough in the various zoological series from the imperfection of the geological record; in museum collections they should be rendered as small as possible.

Prof. Nicholson's book cannot take the place of such a work as Quenstedt's "Petrefactenkunde," which has a proper standpoint as being required by the geologist as a means of identifying fossils. The present work may be described as an attempt to teach students as much as possible about those forms of life which happen to be extinct, by means of the aid of as little knowledge of living forms as possible. The author writes in the introduction: "Palæontology may be considered as the zoology and botany of the past. Regarding it from this, the only true point of view, some knowledge of zoology and botany is essential to the prosecution of the study of palæontology, and such details of these sciences as may be deemed requisite will be introduced in the proper place." *Some* knowledge of zoology and botany is indeed required to make a man a successful palæontologist; the real fact is, that it is only the most skilful and deeply-versed zoologists and botanists who are capable of dealing with the problems of palæontology with any valuable result. Only those most intimately acquainted with living forms are qualified to deal with the fragmentary remains of extinct animals and plants. It would be well, indeed, if the term palæontology were abolished, and with it any pretensions of investigators to treat fossils from a separate standpoint. Botanists are full of complaints of the confusions introduced into their science by the operations of certain palæo-botanists, to use the present author's term, who manufacture genera and species wholesale from impressions of single leaves or even fragments of leaves, and there are plenty of confusions equally detrimental in the nomenclature of extinct animals. It is most illogical to separate the members of the animal and plant series for purposes of study into two groups: that containing those forms which exist at the present epoch, and that embracing those which have lived and mostly become extinct during the vast antecedent period of which record remains. The separation is a purely artificial one, productive of no good, illustrating no general scientific law, coinciding with no natural division of the biological series: and is, further, one especially likely to produce misleading impressions in the minds of students.

Throughout the book the author recurs again and again to the distinction of palæontology as a science from zoology and botany. He writes of palæontology as based on *the kindred sciences* of zoology and botany. "No satisfactory acquaintance with the former can be arrived at without the previous acquisition of some knowledge of the latter." "A few points of these sciences may be noticed as having special bearing on the study of palæontology." Further on, in an account of Prof. Huxley's now abandoned group, the Annuloida, which is retained in the present work, it is mentioned that "The sub-kingdom was proposed by Huxley as a provisional arrangement to include the two groups of the Echinodermata and Scolecida, and the following extraordinary statement follows: *Whether this arrangement be ultimately retained or not matters not at all to the palæontologist, as no member of the Scolecida is known in the fossil condition.* Could any teaching be more pernicious to a student?

After several very good introductory chapters on general geological subjects, Chapter VI. treats of the divisions of the animal kingdom and succession of organic types. The author, after treating of the development theory, concludes by patting the Darwinian theory complacently on the back "as an invaluable, indeed an indispensable, *working hypothesis*," but most unfortunately for the value of his book, he does not make use of the theory as a *working one*, but considers it "preferable to enter upon the study of the actual facts unfettered by præconceptions and unpledged to theories." He accordingly treats of the classification of the animal kingdom in most antiquated style. All animals may be classed under five or six "morphological types," and "no comparison is possible between an animal belonging to one sub-kingdom and one belonging to another, since their distinguishing characters are the results of the modification of two essentially different ground plans."

"We must abandon the idea that it is possible to establish a linear classification of the animal kingdom." But why suggest any such erroneous idea as this latter to the student at all? If only the *working hypothesis* had been adopted, the real meaning of modern scientific

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classification, as representing pedigree and being arborescent in structure might have been pointed out. As it is the impression to be gathered by the student must be that the whole classification is disjointed and artificial. The classification given is obsolete and imperfect in many respects. The Sponges are placed amongst the Protozoa notwithstanding all that is now known of their embryonic development. The Tunicata are placed with the Brachiopods and Polyzoa as composing the Molluscoida. The Sirenia are put next to the Cetacea between the Edentata and Ungulata, and the two are treated of in one chapter as if allied to one another. Finally, man, with his venerable but flattering specific title "sapiens," is placed in the old separate order Bimana, apart from the orang and the gorilla, whilst animals so widely different as the rhinoceros and sheep, nevertheless occupy the same order Ungulata. How perverted must be the conception formed by a student of the value of morphological facts, when the results of their study are presented to him in tabular form on so utterly unequal a scale as this.

A book so large as the present necessarily takes a long time in preparation, and consequently, as the author explains in the preface, many recent publications of importance were not available to him for use in the earlier part of it. Hence the "Tabulata" are still retained as a group amongst the corals, although they have been given up as such by the author in his recent monograph on the Palæozoic tabulate corals.

By far the greater part of the book is taken up by the description of invertebrata, and the vertebrata receive comparatively less attention. Prof. Nicholson gives his reasons for not treating the vertebrata with the same fulness as the invertebrata. "The fossil remains of vertebrates are, in many cases, of the highest interest, but they come much less frequently under the notice of the ordinary student than do the remains of the invertebrates." We should have thought that these would be precisely the reasons why these rarities should be described at length, but "no practical study of the fossil vertebrates can be carried on without a *considerable acquaintance* with comparative osteology." Who, then, is the "working palæontologist" for whose benefit, as we are told in the same paragraph, the present treatise is intended? We can understand the value to a *working geologist* of a book which shall enable him to determine with ease the names of fossils, that he may use them in the prosecution of his researches as so many counters; but the present book does not, like Quenstedt's, meet this requirement in any way.

Granting, however, that there are students who require a work of instruction such as the present, the book is not without many merits, and care has been taken to introduce some account of all recent discoveries of importance. The account of the vertebrata contains a great deal of interest, including an account of some of the most interesting of the discoveries of fossil vertebrata in the United States. A good woodcut of the large tooth-bearing diving-bird, *Hesperornis regalis*, is given, taken from Prof. Marsh's restoration of it. It was between five and six feet in height. Figures are also given of the skull of Prof. Marsh's *Dinoceras mirabile*, with huge canines and three pairs of horn-cores, and also of the feet of the same curious form, which is considered by Prof. Marsh as intermediate between the Perissodactyle Ungulates and the Proboscidea.

The elevation of the Platysomid fishes to the rank of a distinct division of Ganoids is adopted by the author, owing to a misunderstanding of certain manuscripts placed at his disposal by Dr. Traquair, who has disclaimed his concurrence in the matter in the *Annals and Magazine of Natural History*. In consequence of Dr. Traquair's letter a slip has been inserted in all but the earliest copies of the book correcting the error.

The book concludes with chapters on palæobotany, which term hardly describes the contents since they are geologically and not botanically arranged. A slight sketch is given of the floras of the successive geological epochs, the characteristic fossil plants being named and figured but without much account of the details of their structure. An antiquated classification of plants is adopted, the Conifers and Cycads being grouped with the dicotyledonous Angiosperms as Exogens or Dicotyledons, whilst the monocotyledonous Angiosperms are separated from the remainder as Exogens.

There is a glossary of terms at the end of the book in which the Greek words look curious as printed in Roman characters, especially as the long vowels are not marked as such in any way. The first word in the list is Abdomen, which is for some unexplained reason derived from the Latin *abdo*, I conceal, instead of given as itself a Latin word of the same sense as that in which it is used in science. It is surely also doubtful whether the word abdomen has anything to do with *abdo*. It is suggested in some dictionaries that it is a corruption of *adipomen*.

The book is sumptuously got up and contains over 700 woodcuts, most of which are very good, many being familiar as taken from D'Orbigny and elsewhere, but many also being new. Good lists of references to monographs are given at the ends of the chapters, and form a very valuable and important feature in the work.

SIZING AND MILDEW IN COTTON GOODS

Sizing and Mildew in Cotton Goods. By G. E. Davis, C. Dreyfus, and P. Holland. (Manchester: Palmer and Howe.)

THE application of a certain kind of science to a certain kind of commerce is rapidly producing a literature of its own. It is not long since that we had occasion to notice a work which treated of the manner in which silks could be "weighted" by chemical means, and the volume now before us is the second of its kind which is concerned with the relations of chemistry and mycology to the manufacture of cotton goods.

In order to explain the *raison d'être* of this book, it may be desirable to premise that in making cotton cloth it is necessary to "size" the longitudinal threads or warp in order that they may be able to withstand the strain in the loom. The size binds the individual fibres together in the thread, and by giving it an even surface, diminishes the fraying action of the reed in its motion to and fro after the passage of the shuttle. "Pure" size consists of a mixture of fermented flour, soft or curd soap, and tallow; or of sago and cocoa-nut oil in water. The yarn is occasionally sized in the hank by hand, but this method is rapidly giving way to the use of machinery, by means of

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